

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

1. **(Currently Amended)** A method of manufacturing a metal oxide, metal ~~oxidihydroxide~~ oxyhydroxide or metal hydroxide product, said product having a sub-micron primary particle size, comprising:

- introducing a solid reactor filling material into a reactor,
- introducing a metal-containing precursor into said reactor,
- introducing a co-solvent into said reactor,
- introducing a supercritical solvent into said reactor, ~~thereby~~
~~-establishing whereby~~ a contact between the metal-containing precursor and the co-solvent is established, thus and
~~-resulting in the formation of~~
~~- forming~~ said product is in the proximity of said solid reactor filling material.

2-71. (Canceled)

72. **(Currently Amended)** An apparatus for manufacturing a metal oxide, metal ~~oxidihydroxide~~ oxyhydroxide or metal hydroxide product, said product having a sub-micron primary particle size, said apparatus comprising:

- a solid reactor filling material in a reactor,
- means for introducing a metal-containing precursor into said reactor,
- means for introducing a co-solvent into said reactor,
- means for introducing a supercritical solvent into said reactor,

- said reactor intended as a space for adapted to establishing establish a contact between the metal-containing precursor and the co-solvent, and
- said reactor intended as a space for the formation of adapted to form said product in the proximity of said solid reactor filling material.
73. (Currently Amended) An apparatus according to claim 72 The apparatus of claim 72, further comprising means for introducing the solid reactor filling material into the reactor.
74. (Currently Amended) An apparatus according to claim 72 The apparatus of claim 72, further comprising means for extracting the solid reactor filling material from the reactor.
75. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the formation forming of said product takes place by a process involving at least a sol-gel reaction.
76. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the metal oxide, the metal oxidhydroxide oxyhydroxide or the metal hydroxide product is substantially crystalline.
77. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the metal oxide, the metal oxidhydroxide oxyhydroxide or the metal hydroxide product is substantially amorphous.
78. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the metal oxide, the metal oxidhydroxide oxyhydroxide or the metal hydroxide product is a mixture of several comprising at least two different phases.
79. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the introduction of the solid reactor filling material, the metal-containing precursor, the co-solvent, and the supercritical solvent into the said reactor is done in arbitrary order.

80. (Currently Amended) **A-method according to claim 1, The method of claim 1,**

wherein at least one of the solid reactor filling material, the metal-containing precursor, the co-solvent, or the supercritical solvent is mixed with at least one of the solid reactor filling material, the metal-containing precursor, the co-solvent or the supercritical solvent before introduction into said reactor.

81. (Currently Amended) **A-method according to claim 1, The method of claim 1,**

wherein the metal oxide, the metal ~~oxidihydroxide oxyhydroxide~~ or the metal hydroxide product is manufactured in a mode comprising ~~selected from the group consisting of~~: a batch mode, a quasi-batch mode ~~and or~~ a substantially ~~continuos~~ continuous mode.

82. (Currently Amended) **A-method according to claim 1, The method of claim 1,**

wherein a temperature in the reactor during the ~~formation forming~~ of said product is kept at a fixed temperature.

83. (Currently Amended) **A-method according to claim 1, The method of claim 1,**

wherein a temperature in the reactor during the ~~formation forming~~ of said product is performed at an increasing temperature.

84. (Currently Amended) **A-method according to claim 1, The method of claim 1,**

wherein a temperature in the reactor during the ~~formation forming~~ of said product is performed at a decreasing temperature.

85. (Currently Amended) **A-method according to claim 1, The method of claim 1,**

wherein a temperature in the reactor during the ~~formation forming~~ of said product is performed ~~at using~~ a temperature profile including an arbitrary combination of at least two of the following temperature profiles: a fixed temperature, an increasing temperature, ~~and~~ a decreasing temperature.

86. (Currently Amended) A method according to claim 82, The method of claim 82, wherein the maximum temperature in the reactor during the formation forming of said product is maximum 400°C, maximum 300°C, maximum 200°C, maximum 100°C, or maximum 50°C. 400°C, 300°C, 200°C, 100°C, or 50°C.

87. (Currently Amended) A method according to claim 1, The method of claim 1, wherein a pressure in the reactor during the formation forming of said product is kept at a fixed pressure.

88. (Currently Amended) A method according to claim 1, The method of claim 1, wherein a pressure in the reactor during the formation forming of said product is performed at an increasing pressure.

89. (Currently Amended) A method according to claim 1, The method of claim 1, wherein a pressure in the reactor during the formation forming of said product is performed at a decreasing pressure.

90. (Currently Amended) A method according to claim 1, The method of claim 1, wherein a pressure in the reactor during the formation forming of said product is performed at using a pressure profile including an arbitrary combination of at least two of the following pressure profiles: a fixed pressure, an increasing pressure, and a decreasing pressure.

91. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the supercritical solvent is CO₂, and the minimum pressure in the reactor during the formation forming of said product is minimum 74 bar, more minimum 80 bar, minimum 90 bar, or minimum 100 bar. 74 bar, 80 bar, 90 bar, or 100 bar.

92. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the supercritical solvent is CO₂, and the minimum temperature in the reactor during the

~~formation forming~~ of said product is ~~minimum 31°C, minimum 43°C, minimum 100°C, minimum 200°C, minimum 300°C, or minimum 400°C.~~ 31°C, 43°C, 100°C, 200°C, 300°C, or 400°C

93. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the supercritical solvent is isopropanol, and the minimum pressure in the reactor during the ~~formation forming~~ of said product is ~~minimum 47 bar, minimum 80 bar, minimum 90 bar, or minimum 100 bar.~~ 47 bar, 80 bar, 90 bar, or 100 bar.

94. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the supercritical solvent is isopropanol, and the minimum temperature in the reactor during the ~~formation forming~~ of said product is ~~minimum 235°C, minimum 250°C, minimum 270°C, minimum 300°C, or alternatively minimum 400°C.~~ 235°C, 250°C, 270°C, 300°C, or 400°C.

95. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the supercritical solvent is in supercritical phase before the introduction into said reactor.

96. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the supercritical solvent is brought into a supercritical phase after the introduction into said reactor.

97. (Currently Amended) A method according to claim 1, The method of claim 1, wherein the maximum time of for the ~~formation forming~~ of said product is ~~maximum 1 hour, maximum 0.75 hour, or maximum 0.5 hour.~~ 1 hour, 0.75 hours, or 0.5 hours.

98. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the maximum time of for the formation forming of said product is maximum 8
hours, maximum 6 hours, or maximum 2 hours. 8 hours, 6 hours, or 2 hours.

99. (Currently Amended) A method according to claim 1, The method of claim 1,
wherin the maximum time of for the formation forming of said product is maximum 24
hours, maximum 17 hours, or maximum 10 hours. 24 hours, 17 hours, or 10 hours.

100. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing a plurality of different metal-containing precursors into said
reactor.

101. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing into said reactor a metal-containing precursor which is a metal
alkoxide.

102. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing into said reactor a metal-containing precursor selected from the
group consisting of: comprising: titanium tetraisopropoxide, titanium butoxide, titanium
ethoxide, and titanium methoxide, and mixtures thereof.

103. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing into said reactor a metal-containing precursor which is selected
from the group consisting of: comprising: aluminium isopropoxide, and aluminium-sec-
butoxide, and mixtures thereof.

104. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing into said reactor a metal-containing precursor which is
magnesium ethoxide.

105. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing into said reactor a metal-containing precursor which is a metal salt.
106. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing into said reactor a metal-containing precursor which is Ti(SO₄)₂.
107. (Currently Amended) A method according to claim 1, The method of claim 1,
further comprising introducing into said reactor a metal-containing precursor ~~selected from the group consisting of:~~ comprising: TiCl₄, ~~and~~ AlCl₃, and mixtures thereof.
108. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the co-solvent ~~is selected from the group consisting of:~~ comprises: water, ethanol, methanol, hydrogenperoxide, ~~and~~ isopropanol, and mixtures thereof.
109. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein a plurality of different co-solvents is introduced into said reactor.
110. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material functions as a heterogeneous catalyst.
111. (Currently Amended) A method according to claim 108, The method of claim 108,
wherein the solid reactor filling material comprises at least one promoter.
112. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material includes at least one ~~fibre~~ fiber.
113. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material includes a powder.

114. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material has ~~the a~~ shape selected from the group consisting of:
~~comprising;~~ a sponge, a grid, a wad of ~~fibres~~ fibers, and a sheet.
115. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material has a substantially porous structure.
116. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material has a size and shape capable of substantially confining
the metal-containing precursor to a limited part of the reactor.
117. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material comprises a polymer.
118. (Currently Amended) A method according to claim 117, The method of claim 117,
wherein the polymer comprises: polystyrene (PS), polypropylene (PP), polyethylene (PE),
polyvinyl chloride (PVC), polyvinylidene chloride (PVDC), ~~or~~ polyvinyl acetate (PVAc) ~~or~~
mixtures thereof.
119. (Currently Amended) A method according to claim 117, The method of claim 117,
wherein the polymer ~~is selected from the group of:~~ comprises: acrylic polymer, fluorinated
polymer, diene polymer, vinyl copolymer, polyamide polymer, polyester polymer, polyether
polymer, ~~and~~ polyimide polymer, and mixtures thereof.
120. (Currently Amended) A method according to claim 1, The method of claim 1,
wherein the solid reactor filling material comprises a metal.
121. (Currently Amended) A method according to claim 120, The method of claim 120,
wherein the metal comprises: titanium, ~~aluminum~~ aluminum, zinc, vanadium, magnesium,
zirconium, chromium, molybdenum, niobium, tungsten, copper, ~~or~~ iron, or mixtures thereof.

122. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein the solid reactor filling material comprises a metal oxide.

123. (Currently Amended) A method according to claim 122, The method of claim 122,

wherein the metal oxide comprises: titanium oxide, zinc oxide, copper oxide, aluminium
aluminium oxide, vanadium oxide, magnesium oxide, zirconium oxide, chromium oxide,
silicium silicon oxide, molybdenum oxide, niobium oxide, tungsten oxide, ~~or~~ iron oxide, or
mixtures thereof.

124. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein the solid reactor filling material comprises a ceramic.

125. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein the solid reactor filling material comprises a metal sulphate sulfate.

126. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein the solid reactor filling material comprises a metal halide.

127. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein the solid reactor filling material comprises a metal oxide, a metal oxidhydroxide
oxvhdroxide or a metal hydroxide identical to said product resulting from the formation
formed in said reactor.

128. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein the solid reactor filling material functions as is a seed material for the formation
forming of said product.

129. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein the solid reactor filling material functions as is a collecting agent for said product.

130. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein said product is separable from the solid reactor filling material with no further treatments of the solid reactor filling material.

131. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein said product is separable from the solid reactor filling material without substantially degrading the solid reactor filling material.

132. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein said product is separable from the solid reactor filling material in a way that allows the solid reactor filling material to be re-used as solid reactor filling material.

133. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein said product is separable from the solid reactor filling material by flushing the solid reactor filling material in a fluid.

134. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein said product is separable from the solid reactor filling material by vacuum means.

135. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein said product is separable from the solid reactor filling material by blowing means.

136. (Currently Amended) A method according to claim 1, The method of claim 1,

wherein said product is separable from the solid reactor filling material by ultrasonic means.

137. (Currently Amended) A metal oxide, metal oxidhydroxide oxyhydroxide, or metal hydroxide product manufactured by the method according to of claim 1, wherein the metal oxide, the metal oxidhydroxide oxyhydroxide, or the metal hydroxide product is in the form of comprises aggregates of primary particles with on a maximum average primary particle size of maximum 1000 nm, maximum 500 nm, or maximum 100 nm. 1000 nm, 500 nm, or 100 nm.

138. (Currently Amended) A metal oxide product manufactured by the method ~~according to~~ ~~of~~ claim 1, wherein the metal oxide, the metal oxidhydroxide oxyhydroxide or the metal hydroxide product ~~is in the form of~~ ~~comprises~~ aggregates of primary particles with ~~an a maximum~~ average primary particle size of 100 nm, ~~maximum 50 nm, maximum 20 nm, or maximum 10 nm; 50 nm, 20 nm, or 10 nm.~~
139. (Currently Amended) A metal oxide product manufactured by the method ~~according to~~ ~~of~~ claim 1, wherein the metal oxide product is TiO₂, with a minimum crystallinity of ~~minimum 20%, minimum 30%, minimum 40%, minimum 60%, or minimum 80%; 20%, 30%, 40%, 60%, or 80%.~~
140. (Currently Amended) A metal oxide product manufactured by the method ~~according to~~ ~~of~~ claim 1, wherein the metal oxide product is TiO₂ of anatase structure.
141. (Currently Amended) A metal oxide product manufactured by the method ~~according to~~ ~~of~~ claim 1, wherein the metal oxide ~~is selected from the group consisting of;~~ ~~comprises;~~ Al₂O₃, TiO₂, ZrO₂, Y₂O₃, WO₃, Nb₂O₅, TaO₃, CuO, CoO, NiO, SiO₂, Fe₂O₃, and ZnO ~~and mixtures thereof.~~
142. (Currently Amended) A metal oxidhydroxide oxyhydroxide product manufactured by the method ~~according to~~ ~~of~~ claim 1, wherein the metal oxidhydroxide oxyhydroxide ~~is selected from the group consisting of;~~ ~~comprises;~~ iron oxidhydroxide oxyhydroxide, titanium oxidhydroxide oxyhydroxide, manganese oxidhydroxide oxyhydroxide, and aluminium oxidhydroxide oxyhydroxide, and mixtures thereof.
143. (Currently Amended) A metal oxidhydroxide oxyhydroxide product manufactured by the method ~~according to~~ ~~of~~ claim 1, wherein the metal oxidhydroxide oxyhydroxide is aluminium oxidhydroxide oxyhydroxide of Boehmite structure.

144. (Currently Amended) A metal hydroxide product manufactured by the method according to of claim 1, wherein the metal hydroxide is selected from the group consisting of: comprises: iron hydroxide, silicium silicon hydroxide, zirconium hydroxide, titanium hydroxide, manganese hydroxide, and aluminium aluminum hydroxide, and mixtures thereof.

145. (New) A metal oxide product manufactured by the method of claim 1, wherein the metal oxide, the metal oxyhydroxide or the metal hydroxide product comprises aggregates of primary particles with a maximum average primary particle size of 100 nm, 50 nm, 20 nm, or 10 nm; wherein the metal oxide product is TiO₂, with a minimum crystallinity of 20%, 30%, 40%, 60%, or 80%; and, wherein the metal oxide comprises: Al₂O₃, TiO₂, ZrO₂, Y₂O₃, WO₃, Nb₂O₅, TaO₃, CuO, CoO, NiO, SiO₂, Fe₂O₃, ZnO and mixtures thereof.